Q1. Find and sketch the domain of $f(x,y) = \ln(16 - 4x^2 - 4y^2)$. Find the range of $f$.

Q2. Find the limit, if it exists, or show that the limit does not exist

(a) $\lim_{(x,y) \to (0,0)} \frac{xy^3}{x^2 + y^6}$

(b) $\lim_{(x,y) \to (0,0)} \frac{x^3 + y^3}{x^2 + y^2}$
Q3 Find all the second partial derivatives of

\[ z = \arctan\left( \frac{x + y}{1 - xy} \right) \]

Q4 Find the linear approximation of \( f(x, y, z) = \sqrt{x^2 + y^2 + z^2} \) at \((3,2,6)\) and use it to approximate the number \( \sqrt{(3.02)^2 + (1.97)^2 + (5.99)^2} \)